UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

FEB 24 1988

MEMORANDUM

SUBJECT: Chlorothalonil Final Registration Standard and Tolerance Reassessment (FRSTR)

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Attached to this cover memorandum are the Topical Summaries, Disciplinary Review and Generic Data Requirements for the Ecological Effects Branch Chapter of the Chlorothalonil FRSTR.

cc: J. Heckman, MSS (memorandum only)
E. Saito SIS coordinator

TOPICAL SUMMARIES

Effects on Birds

Nine studies were received and evaluated under this topic. These studies were used in performing a hazard assessment.

Author	MRID#
* Dieterich	39146
* Fink	68753
* Shults	30389
* Shults	30388
* Beavers	30395
* Fink	41441
* Fink	41440
* Beavers	115108
* Beavers	115109

In order to establish the toxicity of chlorothalonil to birds, the minimum data required on the technical material are:

- An avian single-dose LD50 test with either one species of waterfowl, preferably the mallard, or one species of upland gamebird, preferably bobwhite (section 71-1); and

- Two avian dietary LC50 tests, one with a species of waterfowl, preferably the mallard, and one with a species of upland gamebird, preferably the bobwhite (section 71-2).

Avian Acute Oral Toxicity - Technical

The acceptable acute oral toxicity study on chlorothalonil is listed below.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Mallard	96%	LD50>4640 mg/kg	Fink	1977	68753	yes

Avian Dietary Toxicity - Technical

The acceptable avian dietary toxicity studies on technical chlorothalonil are listed below.

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* These studies were evaluated in the previous registration standard.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Mallard	Tech.	LC50=21500 ppm	Dieterich	1965	39146	yes
Mallard	96%	LC50=>10000 ppm	Shults	1979	30389	yes
Bobwhite	96%	LC50=>10000 ppm	Shults	1979	30388	yes

The guideline requirements for avian toxicity testing have been fulfilled. These test results show that chlorothalonil is practically non-toxic to birds.

Avian Toxicity Tests with Degradate

Toxicity studies may also be required on any degradate of an active ingredient (section 70-3). Avian studies with DS-3701 were required because it is a primary degradate of chlorothalonil and is extremely persistent. Three studies were submitted.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Mallard	DS-3701*	LD50=158 mg/kg	Beavers	1978	30395	yes
Bobwhite	DS-3701	LC50=1746 ppm	Beavers	1981	115109	yes
Mallard	DS-3701	LC50=2000 ppm	Beavers	1981	115108	yes

* 87% active ingredient

This requirement has been fulfilled. These test results show that DS-3701, a primary degradate of chlorothalonil is moderately to slightly toxic to birds.

Avian Reproduction Studies - Technical Chlorothalonil

Avian reproduction studies may be required (section 71-4). Chlorothalonil is persistent, does not photodegrade rapidly on leaf surfaces and is applied repeatedly for all outdoor uses so a reproductive study on both mallards and bobwhite was required. The following studies were submitted.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Mallard	99.6%	NOEL=50 ppm[1]/	Fink	1976	41441	no
Bobwhite	99.6%	NOEL=50 ppm[1]/	Fink	1976	41440	no

1/ Results are based on eggs laid, eggs set, viable embryos, hatchability, 14-day survival and eggs cracked.

These studies do not fulfill the requirements because the highest test level, 50 ppm, is not high enough to ensure safety to birds at expected concentrations.

Avian Reproductive Studies - Degradate

Avian reproductive studies may also be required for a degradate of an active ingredient (section 70-3). DS-3701 is the primary degradate of chlorothalonil. It is extremely persistent and more toxic to birds than chlorothalonil. Therefore avian reproductive studies on both mallard and bobwhite with DS-3701 is required. No studies have been submitted to fulfill this requirement.

Field Testing

Avian field testing may be required depending on the results of the avian reproduction studies relative to expected chronic exposure.

Precautionary Labeling

Based on the available information, no toxicity labeling for birds is needed.

Effects on Freshwater Fish

Twelve studies were received and evaluated under this topic. These studies were used in performing a hazard assessment.

Author	MRID#
* Shults	56486
* Shults	41439
* Shults et al.	30390
* Pitcher	RIOCHL09
* Shults	30391
* Szalkowski	29410
* Buccafusco	30393
* Pitcher	87304
* Pitcher	87303
* McCann	87258
* Shults	RIOCHL06

Fish Acute Toxicity Tests - Technical

The minimum data required for establishing the acute toxicity of chlorothalonil to fish are the results from two 96-hour studies with the technical product. One with coldwater species, preferably rainbow trout, the other with a warm water species, preferably bluegill sunfish (section 72-1). The acceptable fish studies are listed below.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
R. trout	96%	LC50=47 ppb	Shults	1980	56486	yes
Bluegill	96%	LC50=62 ppb	Shults	1980	41439	yes
Bluegill	99.7%	LC50=84 ppb	Szalkowski	1980	29410	yes
Bluegill	98%	LC50=51 ppb	Pitcher	1976	RIOCHL09	yes
Channel catfish	96%	LC50=43	Shults	1980	30390	yes
Fathead minnow	96%	LC50=23 ppb[1]/	Shults	1980	30391	yes

These studies fulfill the guideline requirement for fish acute toxicity tests for chlorothalonil. They show that chlorothalonil is very highly toxic to both coldwater and warmwater fish.

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* These studies were evaluated and presented in the previous registration standard.

1/ Flow-through test

Fish Acute Toxicity Tests - Formulations

Formulated product studies may be requested (section 70-3). The cranberry use is in close proximity with aquatic habitats such that direct application to water is expected to occur regularly. Testing with both coldwater and warmwater fish is required using the formulation registered on cranberries; the 40.4% ai flowable concentrate. The following tests do not fulfill the requirements for such testing.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
R. trout	75% ai	LC50=152 ppb	Pitcher	1972	87304	No[1/]
R. trout	75% ai	LC50=103 ppb	Pitcher	1972	87303	No[2/]
Bluegill	75% ai	LC50=167 ppb	McCann	1973	87258	No[2/]

These studies show that 75% ai formulations are highly toxic to fish. They would fulfill a requirement for tests with this formulation.

Fish Acute Toxicity Tests - Degradate

Acute fish studies using a degradate of a pesticide active ingredient may be required (section 70-3). Such studies were required because DS-3701, the primary degradate of chlorothalonil, is persistent in water. The following are acceptable fish acute toxicity tests with DS-3701.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Bluegill	DS-3701	LC50=45 ppm	Szalkowski	1979	29410	yes
Bluegill	DS-3701	LC50=16 ppm	Buccafusco	1977	30393	yes

This test shows that DS-3701, primary degradate of chlorothalonil is slightly toxic to warmwater fish. The coldwater fish study is not required since the bluegill study demonstrated that DS-3701 is not more toxic to fish than chlorothalonil. Reproductive testing with the degradate is not required since it is apparently much less toxic than chlorothalonil.

Fish Full Life Cycle Test - Technical Chlorothalonil

[1/] Exposure was only 48 hours.

[2/] Fulfills requirement for a test with a 75% formulation but not the 40.4% formulation.

Fish reproductive studies may be required (section 72.5). Chlorothalonil is registered for uses involving multiple applications and it is likely to reach aquatic habitats because of its widespread use, therefore, a fish reproductive study was required. The acceptable study is listed below.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Fathead minnow	96%	MATC>3<6.5 ppb	Shults	1980	30391	yes

The estimated 96-hour LC50 under flow-through conditions with measured concentrations was 23 ppb (95% C.L.=20 and 26 ppb). Parameters which were affected included number of spawns of F_0 generation fish, and number of F_1 eggs per spawn of F_0 fish.

Field Studies

Field studies may also be required to determine exposure or effects to fish (section 72-7). Based on the toxicity of chlorothalonil, both acute and chronic effects were expected under typical use conditions. Therefore, an aquatic field study was required. It has been completed, (Shults, RIOCHL06) and fulfills the requirements. The purpose of the study was to show that chlorothalonil could be used on soybeans without killing fish. The study demonstrated, with some deficiencies, that after treatment, maximum water concentrations were 0.6 ppb and 1.1 ppb in two ponds adjacent to the treated field. The highest levels in the sediment were 31 ppb and 51 ppb. Both drift and runoff were considered responsible for the contamination. No caged fish mortality was attributed to chlorothalonil. Additional aquatic field studies in the form of residue monitoring are required for the orchard and cranberry uses of chlorothalonil.

Precautionary labeling

The following toxicity statement is required:

"This pesticide is toxic to fish"

Effects on Aquatic Invertebrates

Three studies were reviewed and used to perform a risk assessment on aquatic invertebrates.

Author	MRID#
* Le Blanc	68754
* Suprenant	115107
* Le Blanc	30394
* Shults	RIOCHL06

Acute Aquatic Invertebrate Testing - Technical

The minimum data requirement for establishing the acute toxicity of chlorothalonil to aquatic invertebrates is the result from one 48-hour acute toxicity test with the technical product (section 72-2). The acceptable test is listed below.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Daphnia magna	Tech.	LC50=70 ppb	Le Blanc	1977	68754	yes

This study fulfills the requirement for an acute toxicity test with aquatic invertebrates and shows that chlorothalonil is very highly toxic to this group.

Acute Aquatic Invertebrate Testing - Formulation

Formulated product testing may be required (Section 70-3). The cranberry use is in close proximity with aquatic habitats and is likely to result in direct application to water. An acute test with aquatic invertebrates is required using the 40.4% ai flowable concentrate which is registered on cranberries. No studies have been provided fulfilling this requirement.

Acute Aquatic Invertebrate Testing - Degradate

Toxicity test with degradates may be required (section 70-3). DS-3701, primary degradate of chlorothalonil, is persistent in the aquatic environment. Therefore, acute aquatic invertebrate testing was required. The acceptable test is presented below.

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* These studies were reviewed and presented in the original chlorothalonil registration standard.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Daphnia magna	DS-3701	LC50=26 ppm	Le Blanc	1977	30394	yes

This study fulfills the requirement for an acute aquatic invertebrate toxicity test with DS-3701, primary degradate of chlorothalonil. It shows DS-3701 to be slightly toxic to Daphnia magna. Reproductive testing with DS-3701 on aquatic invertebrates is not required with DS-3701 since it is apparently much less toxic than chlorothalonil.

Reproductive Aquatic Invertebrate Testing - Technical

Reproductive testing with aquatic invertebrates may be required (section 72-4). Since chlorothalonil is registered for uses involving multiple treatments and is expected to reach the aquatic environment from its registered uses, aquatic invertebrate reproductive testing was required. The following test was considered acceptable.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Daphnia magna	99.8%	MATC>39<79 ppb	Suprenant	1981	115107	yes

This MATC is based on significant reduction of F_1 offspring; reported concentrations are calculated based on the measured concentrations which were less than 79% of nominal throughout the study.

Field Studies

Field testing for effects to aquatic invertebrates may be required (section 72-7). Such testing was required for chlorothalonil and has been submitted (Shults, RIOCHL06). The test was acceptable and showed that, when used at label rates on soybeans, chlorothalonil will occur in adjacent ponds at up to 0.6 ppb and 1.1 ppb. Sediment residues reached 31 ppb and 51 ppb. Additional field testing in the form of residue monitoring is required for the cranberry use since it represents a greater hazard to aquatic invertebrates than vegetable and field crop uses and orchards.

Precautionary Labeling

The available data indicate that a precautionary statement for aquatic invertebrates is required. "This pesticide is toxic

to aquatic invertebrates." However, this statement is not necessary since the fish statement takes precedence.

Effects on Estuarine and Marine Organisms

Four studies were received and used to perform the hazard assessment on marine and estuarine organisms.

Author	MRID#
* Armstrong	5001356
* Ward	127863
* Ward	127864
Ward & Shuba	138143

Acute Toxicity Tests - Technical

Toxicity testing with estuarine and marine organisms may be requested (section 72-3). Since chlorothalonil is registered for use on crops which are near estuaries, these studies were requested. The requirements under this category include a 96-hour LC50 for an estuarine fish, a 96-hour LC50 for shrimp and either a 48-hour embryo larvae study or a 96-hour shell deposition study with oysters. The following studies are acceptable.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Sheepshead minnow	Tech	96-hr LC50=32 ppb	Ward	1982	127863	yes
Pink shrimp	Tech	96-hr LC50=165 ppb	Ward	1982	127864	yes
Crassostrea virginica	100% meas	96-hr EC50=3.6 ppb (shell deposition)	Ward & Shuba	1983	138143	yes

These data fulfill the requirements for acute estuarine tests with chlorothalonil. They show that chlorothalonil is very highly toxic to fish and mollusks and highly toxic to shrimp. These estuarine data are required to support the peanut, soybean, corn, golf course turf, cotton, cranberry and marine anti-fouling uses.

Acute Toxicity Tests - Degradate

Degradate testing with estuarine or marine species is not required since DS-3701 is apparently much less toxic to aquatic organisms than the parent.

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* These studies were reviewed and included in the original registration standard.

Acute Toxicity Tests - Formulations

Toxicity tests with formulations may be required (section 70-3) if direct application to estuaries was expected. Such a requirement was not made nor would the following study fulfill such a requirement.

Species	Test Material	Results	Author	Date	MRID	Fulfills Req.
Dungeness crab	75%	96-hr LC50= 140 ppb	Armstrong	1976	5001356	no[1]/

Chronic Estuarine and Marine Tests

Estuarine fish and invertebrate reproduction studies may be required (section 72-4). Chlorothalonil is relatively persistent and is expected to get into estuarine environments, therefore, these tests could be required. The freshwater chronic fish test (fathead minnow, Shults, 1980, 30391) was considered sufficient, since the fathead LC50 (23 ppb) was lower than the sheepshead minnow LC50. However, the mysid shrimp life cycle test is required particularly because of the antifouling paint use which is expected to result in chronic exposure in the estuarine and marine environment.

Precautionary Labeling

The data support the following warning: "This pesticide is toxic to marine/estuarine organisms." However, the freshwater fish statement is takes precedence.

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[1]/ There is presently no requirement for a test on crabs; the LC50 is adjusted to 100% equivalent.

Plant Protection Testing

No studies were received under this topic. To determine toxicity of chlorothalonil to plants, the following studies are required.

122-1: Seed germination/seedling emergence; Vegetative vigor; and
122-2: Aquatic plant growth

These tests are required for terrestrial and aquatic nonfood uses including ornamental, golf course and antifouling paint uses. They are also requested as special testing (Section 70-1) for the cranberry use since it involves application of chlorothalonil in close proximity to aquatic habitat.

Higher tier testing may be required depending on the results of the lower tier tests.

DISCIPLINARY REVIEW

I Ecological Effects Profile

A Technical Chlorothalonil

1. Avian Studies

Four studies show that chlorothalonil is practically nontoxic to birds. An acute oral study (Fink, 1977, 68753) resulted in an LD50 of >4640 mg/kg for mallards. Three 8-day dietary tests, two with mallards (Dieterich, 1965, 39146 and Shults, 1979, 30389) and one with bobwhite quail (Shults, 1979, 30388) had LC50's of >21500 ppm, >10000 ppm and >10000 ppm, respectively.

Two one-generation reproductive studies (Fink, 1976, 41440 and 41441) using bobwhite and mallards, respectively, resulted in NOEL's of 50 ppm (highest level tested) for both.

2. Aquatic Studies

Six studies show that chlorothalonil is very highly toxic to fish. One flow-through test shows the LC50 of chlorothalonil to fathead minnow to be 23 ppb (Shults, 1980, 30391). Other tests provided LC50's of 43, 47, and 51 ppb for channel catfish (Shults, 1980, 30390), rainbow trout (Shults, 1980, 56486), and bluegill (Pitcher, 1976, RIOCHL09), respectively.

A full life-cycle reproductive test with fathead minnows (Shults, 1980, 30391) provided an MATC of >3<6.5 ppb.

One acute study shows that chlorothalonil is very highly toxic to aquatic invertebrates with an LC50 of 70 ppb to Daphnia magna (Le Blanc, 1977, 68754). A life cycle test with Daphnia magna resulted in an MATC of >39<79 ppb (Suprenant, 1981, 115107).

3. Estuarine Studies

Two tests show that chlorothalonil is very highly toxic to estuarine fish and oysters with LC50's of 32 ppb (Ward, 1982, 127863) and 3.6 ppb (Ward & Shuba, 1983, 138143), respectively. Another test showed chlorothalonil to be highly toxic to shrimp with an LC50 of 165 ppb (Ward, 1982, 127864).

4. Mammal Data

The acute rat oral LD50 of > 10000 mg/kg indicates that chlorothalonil is practically nontoxic to mammals. Rat reproductive success was not reduced by chlorothalonil after 2

generations exposure at 15000 ppm. The lactation NOEL was 1500 ppm.

B Degradate, DS-3701

1. Avian Testing

Acutely, DS-3701 is moderately toxic to birds with an LD50 of 158 mg/kg (Beavers, 1978, 30395) with an 87% ai test material.

2. Aquatic Testing

Two tests show that DS-3701 is slightly toxic to fish with LC50's of 16 ppm and 45 ppm for bluegill (Buccafusco, 1977, 30393 and Szalkowski, 1979, 29415, respectively). DS-3701 is slightly toxic to Daphnia magna with an LC50 of 26 ppm (Le Blanc, 1977, 30394).

3. Mammal Data

The degradate DS-3701 is moderately toxic to dogs, with an acute oral LD50 of 100 mg/kg.

C Formulated Product Testing, 75% ai

Three tests show that a formulation containing 75% ai chlorothalonil is highly toxic to fish with LC50's of 103 ppb and 152 ppb for rainbow trout (Pitcher, 1972, 87303 and 87304) and an LC50 of 167 ppb for bluegill (McCann, 1973, 87258).

D Manufacturing Use

The EEB does not perform a hazard assessment on the manufacturing-use product.

II Uses

Chlorothalonil is a non-systemic protectant fungicide used to control foliar diseases of vegetable and ornamental crops. It is also registered for peanuts, soybeans, papaya, passion fruit, citrus, application to seeds of cotton, and as a antimildew and antifouling paint additive. It can be applied to crops as a granular, spray or dust via ground or aerial application. Treatment may also be done by overhead irrigation systems.

A Use Sites and Use Rates

Crop	Max Use Rate lbs. ai/acre	Number applications	interval days
Terrestrial Food Crops (A)			
melons, pumpkins, squash garlics, onions, snap beans, celery	2.25	M	7
dry beans, parsnips orchard grass	1.6	M	7-10
broccoli, brussels sprouts, cabbage, cauliflower, carrots, potatoes, corn	1.5	M	4-10
cucumber	2.25 6.255	M 1	7
bluegrass, Chinese cabbage (SLN), rye grass forage and fodder grass	1.125	M	7-10
tomato	2.25	M	10-14
mint	1.08	3	7-10
peanuts	1.15 1.5 (irrigation equipment)	M	7
soybeans	1.43 1.82	3 2	14 14
Sugar beets (SLN-OR)	1.3	M	7
Coffee (SLN-PR) nursery stock	4.17 lb/gal	M	10-14

Crop	Max Use Rate lbs. ai/acre	Number applications	interval days
Terrestrial Food Crops Cont'd			
fruits:			
passion fruit (HI only)	1.5	M	14
papaya	3.0	M	14
stone fruit (peach, nectarine, apricot, cherry, plum, prune)	4.17	4	>30
cotton (seed treatment)	1.2 oz/100 lbs. seed.		
cranberry	5.2	3	10-14
Terrestrial Non-Food Crops (B)			
ornamental plants (bluegrass and ryegrass for seed, flowers and shrubs)	1.125	M	7-10
ornamental forest and tree conifers	4.17	1	
	2.085	M	7-14
turf	7.5	M	14-21
Aquatic Nonfood (D)			
marine antifouling paints	5.2 to 21.3% formulations		
Greenhouse, Food and Nonfood (E,F)	0.04 lb/1000 sq. ft.		
Forestry (G)	ornamental plants and forest trees (see above)		
Domestic Outdoor (H)			
ornamentals	(see above)		
wood preservatives	(0.42 to 0.71 percent formulations)		
Indoor (I)			
wood protection			

B Discussion of Uses

According to the Preliminary Quantitative Use Assessment, Oct. 28, 1987 the primary usage of chlorothalonil is on peanuts. Paint, tomatoes and golf courses are also major poundage users of chlorothalonil. See Figure 1. Two state registrations are for use sites not Federally registered; sugar beets in Oregon and coffee in Puerto Rico. Other state registrations are for modified treatment methods for existing Federally registered uses.

III Environmental Fate Information

Except where specifically referenced, the following information was taken from EAB reviews dated 4-5-79 and 4-2-76 by R. Ney and R. Terkowitz, respectively.

A Soils

Chlorothalonil degrades at a moderate rate in most soils, with a half-life of less than 30 days. Lack of moisture tends to slow down the degradation process. Rate of breakdown increases as temperature rises from 21°C to 39°C. DS-3701 is the major degradate of chlorothalonil. It is extremely persistent with no dissipation observed within 90 days. It leaches in many types of soil.

Based on a more recent EAB review, 8-1-86 aged chlorothalonil is slightly mobile to mobile in most soils. DS-3701 is mobile in most soils. The Freundlich K_{ads} values were 26, 29, 20 and 3 for silty clay, silt, sandy loam and sand, respectively.

B Water

Based on a 4-22-86 review, chlorothalonil is stable to hydrolysis for 30 days at pH 5 and 7. At pH 9, 10% will degrade to 2,4,5,6-tetrachloroisophthalamide in 30 days. The halflife in flooded sandy loam (sediment) was 5-15 days.

DS-3701 is stable to hydrolysis.

C Plant

Chlorothalonil apparently does not translocate from soil to plants. Both chlorothalonil and DS-3701 are stable to photodegradation on surfaces. Crops treated with 3.75 lbs. ai/acre have been analyzed, with residues of 3 ppm and 0.26 ppm

FIGURE 1

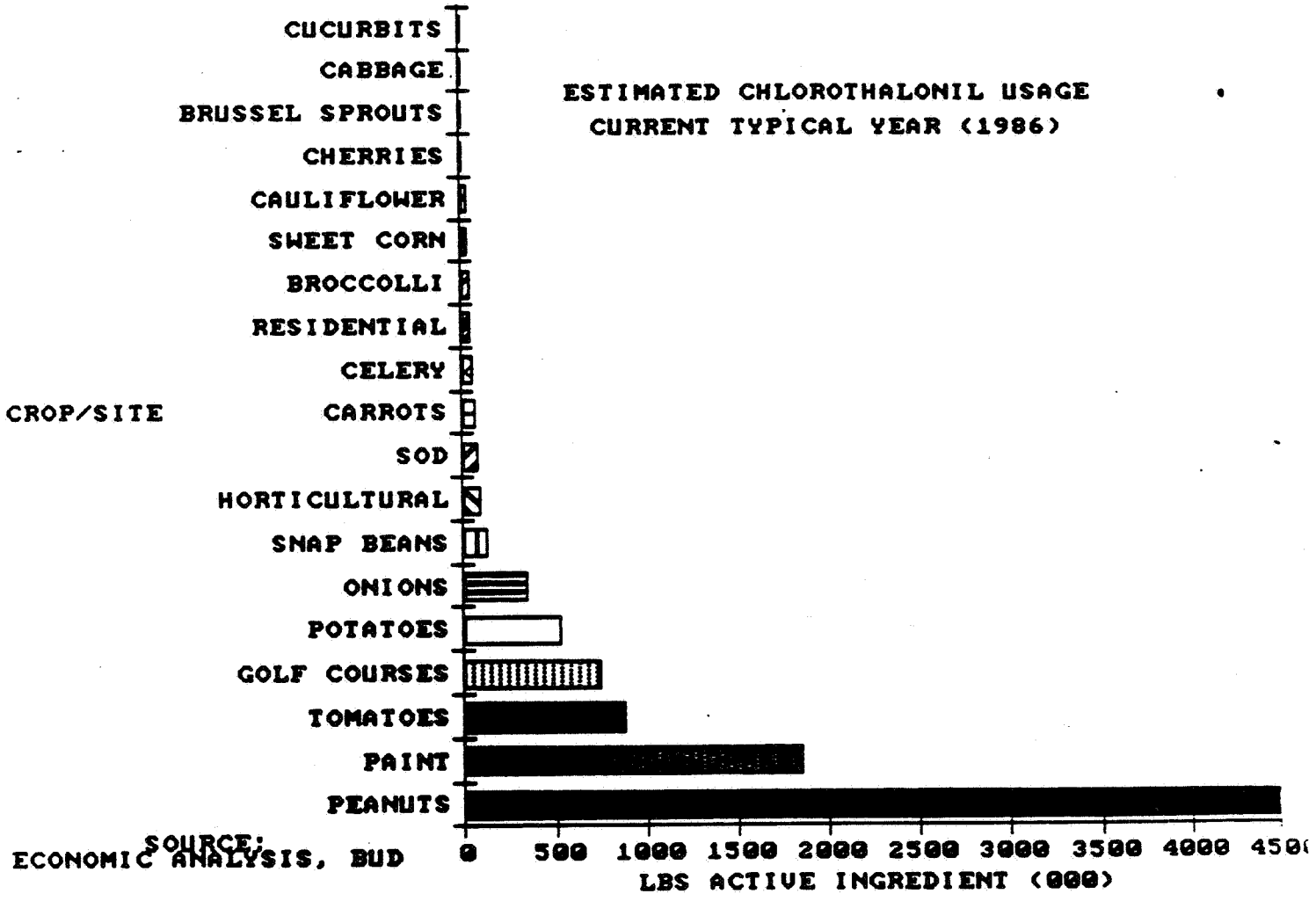

ESTIMATED CHLOROTHALONIL USAGE
CURRENT TYPICAL YEAR (1986)
CROP/SITE
CUCURBITS
CABBAGE
BRUSSEL SPROUTS
CHERRIES
CAULIFLOWER
SWEET CORN
BROCCOLLI
RESIDENTIAL
CELERY
CARROTS
SOD
HORTICULTURAL
SNAP BEANS
ONIONS
POTATOES
GOLF COURSES
TOMATOES
PAINT
PEANUTS
0 500 1000 1500 2000 2500 3000 3500 4000 450
LBS ACTIVE INGREDIENT (000)
SOURCE:
ECONOMIC ANALYSIS, BUD

Table 1

ANNUAL U.S. USAGE OF CHLOROTHALONIL
Current Typical Year
1986

Sector/Site	Lbs. a.i. Applied (000)	% of Total Pounds	% of Site Treated
Agricultural			
Beans, Snap	130	1.4	24
Broccoli	38	0.4	31
Br. Sprouts	6	0.1	83
Cabbage	5	0.1	4
Carrots	72	0.8	41
Cauliflower	26	0.3	34
Celery	50	0.5	97
Cherries	9	0.1	8
Cucurbits	6	0.1	
Peanuts	4,500	47.1	70
Potatoes	527	5.5	11
Onions	352	3.7	51
Sweet Corn	27	0.3	10
Tomatoes	882	9.2	50
Industrial/Residential			
Paint	1,850	19.4	33
Wood/Grouts	40	0.4	<1
Ornamental/Turf			
Golf Courses	750	7.9	30
Horticulture	90	0.9	
Sod Farms	80	0.8	1
TOTAL	9,550	100.0	

for chlorothalonil and DS, respectively after 42-76 PHI. (RCB review by P. Errico dated 8-13-80).

Vapor pressure is 5.72×10^{-7} at 25°C.

D Animals

The bioconcentration of chlorothalonil in bluegill plateaus at 60 to 200X in edible tissue and 900 to 3000X in nonedible tissues. DS-3701 bioconcentration in bluegill plateaus at 50X in edible tissue and 250X in nonedible tissues. Residues of both parent and degradate declined to less than 50% after 7 to 10 days in clean water.

IV Hazard Assessment

A Discussion

The available information indicates that chlorothalonil:

1. Is extremely toxic to all aquatic organisms;
2. Significantly reduces fish reproduction at very low concentrations; but
3. Is practically nontoxic to birds and mammals.

Furthermore, the data show that DS-3701 is:

1. Slightly toxic to the aquatic organisms tested; and
2. Moderately to slightly toxic to birds.

According to environmental fate information, chlorothalonil could have a halflife of up to 30 days in soil and is stable to hydrolysis for 30 days in water. The halflife in sediment is 5 to 15 days, but it does not photodegrade on leaf surfaces.

DS-3701 is stable to hydrolysis and is extremely persistent in soil with no degradation in 90 days. It leaches in many soils. It does not photodegrade.

The primary agricultural uses for chlorothalonil includes peanuts and potatoes (1.5 lbs. ai/a). While chlorothalonil is registered for use on dry beans and soybeans, apparently less than 5,000 lbs ai are applied annually to either one. On a lesser basis, tomatoes and onions are treated at 2.25 lbs. ai per acre. Chlorothalonil is also registered for use on golf courses at 7.5 lbs. ai per acre.

B Terrestrial

The three rates mentioned above (1.5, 2.25, and 7.5 lbs. ai

per acre) will be used to estimate exposure on terrestrial food items. The following table shows the maximum and typical residues expected on various types of terrestrial food items.

	short grass	long grass	leafy crops	insects forage	seed pods	fruit
1.5 lbs. ai/acre						
maximum	360	165	188	87	18	11
typical	188	138	53	50	5	2
2.25 lbs. ai/acre						
maximum	540	248	281	131	27	16
typical	281	207	79	74	7	3
7.5 lbs. ai/acre						
maximum	1800	825	938	435	90	53
typical	938	690	263	248	23	11

These residues are substantially lower than the avian LC50's (>10000 ppm for mallard and bobwhite, Shults, 1979, 30389 and 30388, respectively). With an LD50 of >10000 mg/kg (dog), these residues are unlikely to exceed acute effect levels for mammals. Therefore, no acute effects are expected to terrestrial nontarget organisms. Further, these residues are lower than the mammal reproductive NOEL of 15000 ppm (rat 3-generation) so they should not cause chronic effects to mammals. These residues are higher than the highest level tested in the avian reproductive test levels (50 ppm) so even though no effects were observed, chronic safety cannot be concluded.

While information suggests that chlorothalonil is stable to photodegradation on plant surfaces, field tests have shown that chlorothalonil has an average fungicidal activity of 2.8 weeks (Neely, 1970) after application of 2 lbs. per 100 gallons of water. Further, crops treated with 3.75 lbs. ai per acre had residues of 3 ppm and 0.26 ppm for chlorothalonil and DS-3701, respectively, after 42 to 76 days (RCB review by P. Errico, 8-13-80). Therefore, repeated applications are unlikely to result in accumulation of chlorothalonil residues on terrestrial food items.

Terrestrial adverse effects from the paint use are expected to be minimal since the ai leaches from the paint slowly and is unlikely to resorb to food items (or waterfowl, for example) in sufficient quantities to be hazardous.

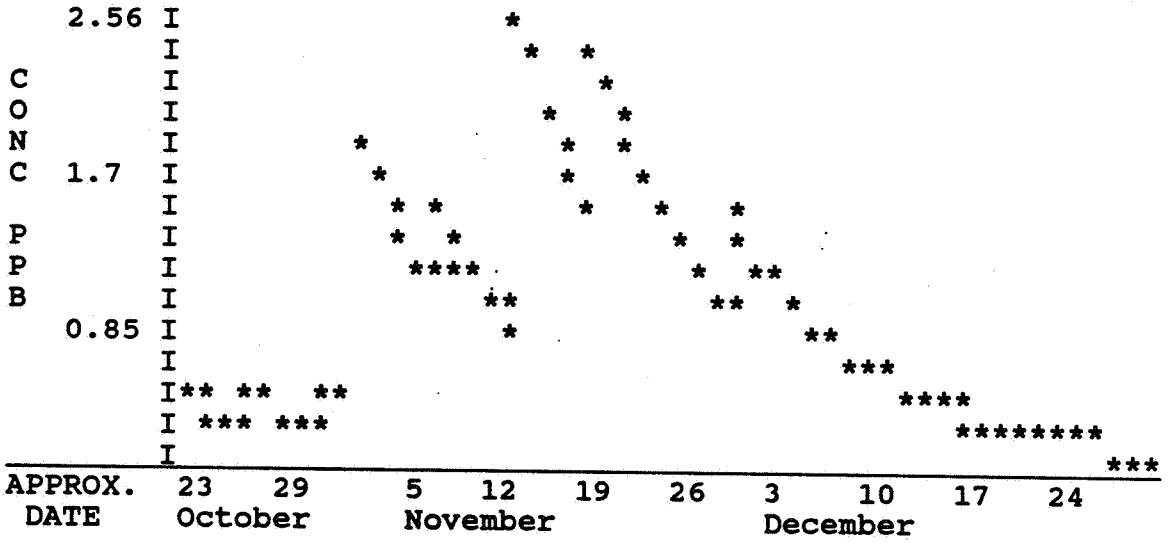
C Aquatic

Two aquatic exposure simulation models were run for chlorothalonil. One for soybeans and another for pecans, both in Mississippi. The scenario involved a area of treated land draining into a pond that was 0.1 the surface area of the land treated and was 6 feet deep. A SWRRB model was used to estimate runoff; EXAMS II was used to simulate its fate in the adjacent

waterbodies. The soybeans scenario rate was 1.8 lbs. ai per acre with two applications in July and August with 14-day interval. The pecan rate was 3.15 lbs ai per acre with 9 applications per season from March to July with 14-day intervals. While chlorothalonil is not presently registered on pecans, the scenario is also applicable to other fruit tree uses such as peach, nectarine, apricot, cherry, plum and prune. During a typical runoff year, the following maximum concentrations were estimated.

Rate	Water Body Concentration (ppb)		
	Pond[2]	Stream 1[3]	Stream 2[4]
lbs. ai/A	water/sediment	water	water
1.8	2.6 / 49.6	1.4	0.6
3.15	30 / 466	14	5

The following graph chart shows the expected concentrations of chlorothalonil in pond water after two treatments of soybeans at 1.8 lbs. ai per acre in July and August.



The concentration in water adjacent to tomato or onion fields may be slightly higher (3.2 ppb rather than 2.56 ppb since the use rate for tomatoes is 1.25 times higher than that for soybeans). However, these concentrations do not represent

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[2] A Georgia farm pond 2 meters deep, with 1 hectare surface area.

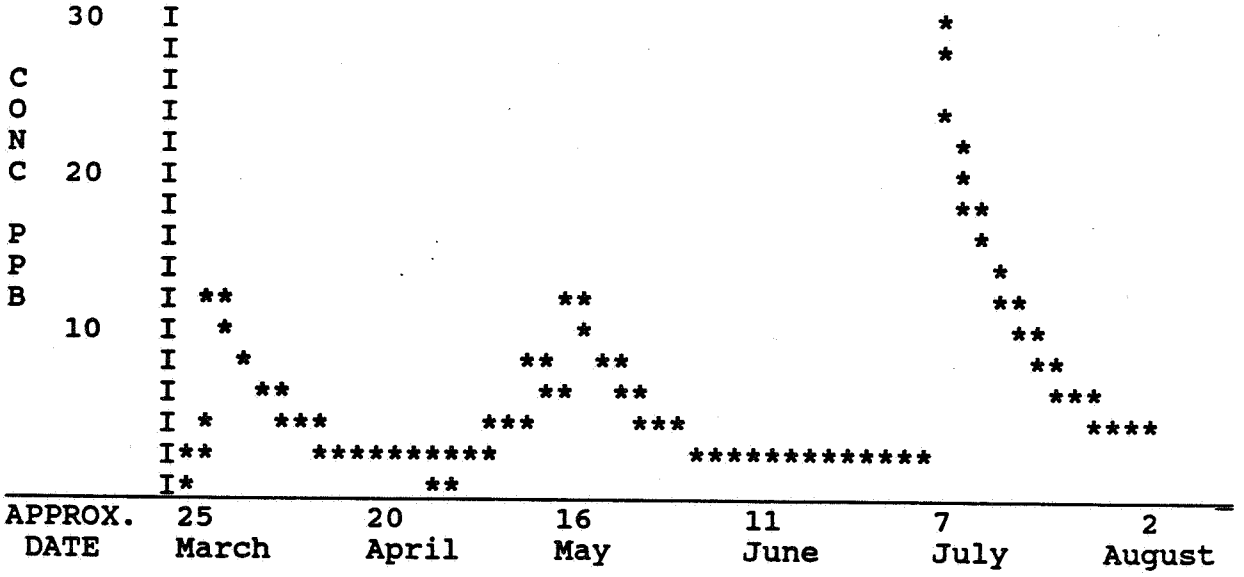
[3] A short (100 meter) connecting stream (3 meters wide X 0.5 meters deep) from the pond to stream 2.

[4] Long section of stream (300 meters) that is 3 meters wide X 0.5 meters deep.

acute hazard to fish or aquatic invertebrates since they do not exceed 1/2 the lowest fish acute toxicity level of 23 ppb (Shults, 1980, 30391) nor 1/2 the acute toxicity level for aquatic invertebrates (Daphnia magna LC50=70 ppb, Le Blanc, 1977, 68754). Acute hazard to nonendangered freshwater mussels will be minimal since the concentration in streams below ponds are less than 1/2 the oyster EC50 of 3.6 ppb (Ward and Shuba, 1983, 138143). Chronic effects are not expected because the estimated concentrations barely approach the fathead minnow full life cycle MATC of >3<6.5 ppb (Shults, 1980, 30391) and are expected to decline rapidly causing minimal chronic exposure. They are much lower than the Daphnia magna life cycle MATC of >39<79 ppb (Suprenant, 1981, 115107). If the adjacent waterbody was near enough and the wind conditions "favorable", drift (assuming 5%) could result in additional loading up to 6.9 ppb. However, in most cases, it is unlikely that drift would occur with each treatment and at the same time maximum concentrations from runoff occur. Furthermore, as the graph shows, residues in the water would decrease to below chronic concern levels in a few days. The drift exposure could occasionally exceed the oyster EC50 of 3.6 ppb (Ward and Shuba, 1983, 138143), causing local adverse effects to mollusks.

The graph does suggest that chlorothalonil will persist in the field and be available for runoff several months after treatment.

The following graph shows the concentrations of chlorothalonil in pond water after multiple treatments of fruit trees at 3.15 lbs ai per acre during a typical year.



The actual maximum use rates of 4.17 lbs. ai per acre would be expected to result in even higher concentrations. Since 4.17 is 1.32 times higher than 3.15, the maximum concentrations expected would be 39.6 ppb (1.32 X 30 = 39.6). These levels are expected to adversely affect fish and mollusks since they exceed both the lowest LC50 (fathead minnow LC50=23 ppb, Shults, 1980, 30391), the fish full life cycle reproductive effect level of 6.5 ppb (Shults, 1980, 30391), and the oyster EC50 of 3.6 ppb (Ward and Shuba, 1983, 138143). Drift (5% of 4.17 into 6 feet of water) could result in exposure concentrations of 12.7 ppb. Hazardous exposure could occur off and on throughout the summer.

Neither acute nor chronic effects are expected to aquatic invertebrates, other than mussels, since these concentrations do not exceed 1/2 the Daphnia magna LC50 of 70 ppb (Le Blanc, 1977, 68754) nor the Daphnia magna life cycle NOEL of 39 ppb (Suprenant, 1981, 115107). Since drift would not likely occur simultaneously with maximum runoff events, it would not be expected to exceed aquatic invertebrate acute or chronic effect levels.

While cranberries do not represent a significant usage of chlorothalonil, treatment may result in substantial impact to local aquatic communities. Cranberries are grown in close proximity to important aquatic habitat. The use rate, 5.2 lbs. ai per acre is likely to result in hazardous exposure levels since direct application to water would be expected frequently. Multiple seasonal treatments would cause chronic availability of those concentrations. Based on the attached EEC calculation, the concentration in water adjacent to or downstream from treated cranberry fields could reach 31.7 ppb and 52.2 ppb following ground and aerial application, respectively. These concentrations exceed fish LC50's (fathead minnow flow-through LC50=23 ppb, Shults, 1980, 30391; channel catfish, LC50=43 ppb, Shults, 1980, 30390 and rainbow trout LC50=47 ppb, Shults, 1980, 56486) and would approach the aquatic invertebrate LC50 of 70 ppb (Daphnia magna, Le Blanc, 1977, 68754). they also amply exceed the mollusk EC50 of 3.6 ppb (Crassostrea virginica, shell deposition, Ward and Shuba, 1983, 138143) and could thus impact freshwater mussels. The persistence of chlorothalonil, in combination with multiple applications, could result in chronic exposure. Formulated testing with fish and aquatic invertebrates is required for the 40.4% ai flowable concentrate registered on cranberries. Residue monitoring of aquatic habitats within and downstream from treated cranberry producing areas is required to quantify exposure to fish and aquatic invertebrates.

Exposure due to the golf course use would be expected to occasionally cause adverse effects to local aquatic communities. If the values from the models presented earlier are used to extrapolate to the higher use rate on golf courses, the following estimated concentrations are calculated.

Scenario	Peak Residues	Extrapolated to 7.5 lbs ai
Soybeans	2.6 ppb	10.8 ppb
Pecans	30	71.4 ppb

Therefore, it is likely that in water adjacent to golf courses, aquatic organisms including invertebrates will be adversely affected. However, due to the limited acreage involved and the relatively short half-life of chlorothalonil in water, these effects would be localized and not unreasonable, except for endangered species near China Lake golf course, see Endangered Species Section.

Leaching from paint on submerged materials is expected to be at such a rate that acute adverse effects would be unlikely considering the toxicity of chlorothalonil. However, chronic effects from continuous leaching and long-term hazard from residue associated with sediment cannot be determined without additional data. Such data include a shrimp life cycle test (72-4) and aquatic organism accumulation testing with species other than fish, especially bivalves (72-6).

D Summary of Hazard

Adverse acute effects to terrestrial organisms are not anticipated based on available information, however, chronic safety to birds from all uses cannot be concluded until adequate reproduction data are available. The majority of the usage of chlorothalonil is not expected to have a severe adverse effect on aquatic organisms. However, the use of chlorothalonil on orchards would be expected to cause acute and chronic effects to fish but not aquatic invertebrates. The cranberry use is expected to adversely effect all aquatic organisms including fish, invertebrates and mollusks. Additional data are needed to assess chronic hazard from antifouling paint use.

V Endangered Species

A Triggers

The endangered species triggers are as follows:

Group	Trigger
Birds	unavailable[5]
Mammals	1500 ppm (mammal rep. NOEL)
Fish	3 ppb (fish rep. NOEL[6])
(or)	1.15 ppb (1/20th fish LC50[7])
Aquatic Inv.	3.5 ppb (1/20th Daphnia magna LC50[8])
Mollusks	0.16 ppb (1/20th oyster EC50[9])

B Exposure

The following table shows the maximum and typical residues expected on various types of terrestrial food items.

	short grass	long grass	leafy crops	insects forage	seed pods	fruit
1.125 lbs. ai/acre						
maximum	360	165	188	87	18	11
typical	188	138	53	50	5	2
2.25 lbs. ai/acre						
maximum	540	248	281	131	27	16
typical	281	207	79	74	7	3
7.5 lbs. ai/acre						
maximum	1800	825	938	435	90	53
typical	938	690	263	248	23	11

The typical residues estimated for terrestrial food items do not exceed the mammalian reproductive NOEL. Maximum residues following treatment of orchards may occasionally exceed the level which affected lactation in rats in a two-generation reproduction test (1500 ppm). However, since this is an estimation of peak residues it is not likely that these residues

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[5] Since multiple applications represent potential for chronic exposure, results from an avian reproduction test at appropriate test levels are required.

[6] Fathead minnow NOEL=3 ppb, Number of F_0 spawns and number of F_1 eggs per F_0 spawn were reduced at 6.5 ppb, Shults, 1980, 30391.

[7] Fathead minnow LC50=23 ppb Shults, 1980, 30391.

[8] Daphnia magna LC50=70 ppb, Le Blanc, 1977, 68754.

[9] Oyster EC50=3.6 ppb Ward & Shuba, 1983, 138143.

would be available on a continuous basis. Adverse effects to endangered mammals are not expected based on estimated residues. Impact to endangered bird species based on estimated residues cannot be evaluated without adequate reproductive test results. Safety to other terrestrial endangered species cannot be concluded until acceptable avian reproduction data are available.

During a typical runoff year, the following maximum concentrations were estimated.

Rate	Water Body Concentration (ppb)		
	Pond[10]	Stream 1[11]	Stream 2[12]
lbs. ai/A	water/sediment	water	water
1.8 (soybeans)	2.6 / 49.6	1.4	0.6
3.15 (pecans)	30 / 466	14	5

The concentrations in pond water adjacent to tomato or onion fields may be 3.2 ppb, rather than 2.6 ppb, since the maximum label is higher for these uses than for soybeans. Also, the concentration due to drift (assuming 5%) could be as high as 5.5 ppb. These estimated residues exceed the endangered species triggers for both fish, mussels and aquatic invertebrates. Concentrations in streams draining from ponds receiving runoff from treated agricultural fields would exceed the mollusk endangered species trigger. Based on estimated exposure levels, the use of chlorothalonil could affect endangered aquatic species, including aquatic stages of amphibians.

C Previous Opinions

The following lists each use of chlorothalonil and indicates whether it has been included in a cluster opinion or case-by-case biological opinion on endangered species from USFWS.

---

[10] A Georgia farm pond 2 meters deep, with 1 hectare surface area.

[11] A short (100 meter) connecting stream (3 meters wide X 0.5 meters deep) from the pond to stream 2.

[12] Long section of stream (300 meters) that is 3 meters wide X 0.5 meters deep.

Crop	Opinion
Terrestrial Food Crops (A)	
melons	Captafol (10-4-84), Endosulfan (7-30-82)
pumpkins	Endosulfan
squash	Endosulfan
garlics	
onions	Captafol
snap beans	Endosulfan, Thimet (1-22-82)
celery	Endosulfan
dry beans	Endosulfan, Thimet
broccoli	Endosulfan
brussels sprouts	Endosulfan, Thimet
cabbage	Endosulfan
cauliflower	Endosulfan
carrots	Endosulfan
potatoes	Captafol, Endosulfan, Thimet
corn	Captafol, Endosulfan, Thimet, Cluster
cucumber	Captafol, Endosulfan
parsnip	
bluegrass	
Chinese cabbage	
rye grass	
tomato	Captafol, Thimet
mint	
peanuts	Captafol, Thimet
soybeans	Endosulfan, Thimet, Cluster
fruits:	
passion fruit (HI only)	
papaya	
stone fruit (peach, nectarine, apricot, cherry, plum, prune)	Captafol, Endosulfan
cotton (seed treatment)	Endosulfan, Cluster
Terrestrial Non-Food Crops (B)	
ornamental plants (bluegrass and ryegrass for seed, flowers and shrubs)	Endosulfan
ornamental forest and tree conifers	Endosulfan
turf	CGA-12223 (1-10-84), Diazinon (1-17-86)
Aquatic Food (C)	
cranberry	Captafol
Aquatic Nonfood (D)	
marine antifouling paints	

Greenhouse, Food and Nonfood (E,F)

greenhouse

Forestry (G)

ornamental plants and forest trees

Domestic Outdoor (H)

ornamentals
wood preservatives

Indoor (I)

wood protection

D Discussion

Essentially all uses of chlorothalonil have been addressed in one or more biological opinions from USFWS. The conclusions from these opinions will be used to determine hazard to endangered species. It is unlikely that the uses for which opinions were not available, i.e. marine antifouling paint, greenhouse and wood protection, would affect endangered species.

Agriculture and field crops are expected to adversely effect the following endangered species.

Species	Route/Use Examples
Wood stork[13]	indirect through reduction of food supply (fish)/veg.
Everglades kite[13] [14]	indirect through reduction of food supply (apple snail)/veg.
Colorado squawfish[13]	direct toxicity/veg., orchards
Woundfin[13]	direct toxicity/veg., orchards
Leopard darter[13]	direct toxicity/veg., peanuts, orchards
Humpback chub[13]	direct toxicity/veg., corn, orchards

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[13] Captafol opinion, 10-4-84

[14] Endosulfan opinion, 7-30-82

Species	Route/Use Examples cont'd
Bonytail chub[13]	direct toxicity/veg., orchards
Ozark cavefish[13]	direct toxicity/
Unarmored threespine stickleback[13]	direct toxicity
Maryland darter[13]	direct toxicity
Slackwater darter[13]	direct toxicity
Alabama cavefish[15]	direct toxicity/veg. orchards, peanuts
Freshwater mussels (naiades) (22 species)[13] [14]	direct toxicity/veg. field crops, orchards
Pine Barrens treefrog[14]	direct toxicity/soybeans, agr. crops
Houston toad[14]	direct toxicity/corn, soybeans
Santa Cruz long-toed salamander[14]	direct toxicity/veg.

The following species were identified in the Diazinon opinion, no jeopardy was concluded in the CGA-12223 opinion.

Species	Route/Use Examples
Mohave tui chub[16]	direct toxicity/golf course at China Lake Naval Weapons Center

There are several endangered bird and reptile species in Puerto Rico where chlorothalonil is used on nursery coffee plantings. The amphibian, golden coqui, occurs in southeastern PR and would likely be effected if its aquatic stage was exposed to chlorothalonil.

Endangered bird species that could be effected directly through chronic exposure were not included, since it is not possible to complete an assessment of hazard to them. When the avian reproduction studies have been completed, the evaluation will be completed.

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[15] Thimet opinion, 1-22-82

[16] Diazinon opinion, 1-17-86

The EEB will initiate consultation with the USFWS when adequate avian reproduction data have been provided.

VI Precautionary Labeling

A. Manufacturing Use

This pesticide is toxic to fish. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. Do not discharge effluent containing this product to sewer systems without previously notifying the sewage treatment plant authority. For guidance, contact your State Water Board or Regional Office of the EPA.

B. End-Use Products

1. Non-aquatic use sites:

This pesticide is toxic to fish. Do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwater.

2. Non-Aquatic use sites such as cranberries

This pesticide is toxic to fish. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwater.

3. Combination of 1 and 2

This pesticide is toxic to fish. Except for cranberries, do not apply directly to water or wetlands (swamps, bogs, marshes, and potholes). Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwater.

V DATA REQUIREMENTS

The required data are provided in Table A, attached.

TABLE A
GENERIC DATA REQUIREMENTS FOR CHLOROTHALONIL

Data Requirement	Composition[1]/	Use Pattern[2]/	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
§158.145 Wildlife and Aquatic Organisms					
AVIAN AND MAMMALIAN TESTING					
71-1 - Avian Oral LD_{50}	TGAI	A,B,D,G,H	yes	68753	no
	Deg. DS-3701	A,B,G,H	yes	30395	no
71-2 - Avian Dietary LC_{50} a. waterfowl	TGAI	A,B,D,G,H	yes	39146 30389	no
	Deg. DS-3701	A,B,G,H	yes	115108	no
b. upland game bird	TGAI	A,B,D,E,F,G,H,I	yes	30388	no
	Deg. DS-3701	A,B,G,H	yes	115109	no
71-3 - Wild Mammal Toxicity	TGAI	A,B,D,G,H	no		no[3]
71-4 - Avian Reproduction a. waterfowl	TGAI	A,B,D,G,H	partially	41441[4]*	yes
	Deg. DS-3701	A,B,D,G,H	no		yes
b. upland game bird	TGAI	A,B,D,G,H	partially	41440[4]*	yes
	Deg. DS-3701	A,B,D,G,H	no		yes

TABLE A
GENERIC DATA REQUIREMENTS FOR CHLOROTHALONIL (CONTINUED)

Data Requirement	Composition[1]/	Use Pattern[2]/	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
§158.145 Wildlife and Aquatic Organisms					
AVIAN AND MAMMALIAN TESTING (continued)					
71-5 - Simulated and Actual Field Testing with Mammals and Birds	TEP	A,B,D,G,H	no		reserved[5]
AQUATIC ORGANISM TESTING					
72-1 - Acute Toxicity Freshwater Fish					
a. warmwater	TGAI	A,B,D,G,H	yes	41439, 29410 30390, 30391 RIOCHL09	no
	TEP	A[6]	no		yes
	Deg. DS-3701	A,B,D,G,H	yes	29415, 30393	no
b. coldwater	TGAI	A,B,D,E,F,G,H,I	yes	56486	no
	TEP	A[6]	no		yes
	Deg. DS-3701	A,B,D,G,H	no		no[7]

TABLE A
GENERIC DATA REQUIREMENTS FOR CHLOROTHALONIL (CONTINUED)

Data Requirement	Composition[1]/	Use Pattern[2]/	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
§158.145 Wildlife and Aquatic Organisms					
AQUATIC ORGANISM TESTING (continued)					
72-2 - Acute LC_{50} Freshwater Invertebrates	TGAI	A,B,D,E,F,G,H,I	yes	68754	no
	TEP	A[6]	no		yes
	Deg. DS-3701	A,B,D,G,H	yes	30394	no
72-3 - Acute LC_{50} Estuarine					
Fish	TGAI	A,B,D[8]	yes	127863	no
	TEP	A[6]	no		reserved[9]
Shrimp	TGAI	A,B,D[8]	yes	127864	no
	TEP	A[6]	no		reserved[9]
Mollusk	TGAI	A,B,D[8]	yes	138143	no
	TEP	A[6]	no		reserved[9]
72-4 - Fish Early Life Stage and Aquatic Invertebrate Life-cycle	TGAI	A,B,D,G,H	no		no[10]
	TGAI	A,B,D,G,H	yes	115107	yes[11]
72-5 - Fish full life-cycle	TGAI	A,B,D,G,H	yes	30391	no
72-6 - Aquatic Organism Accumulation	TGAI	A,B,D,G,H	no		yes12

TABLE A
GENERIC DATA REQUIREMENTS FOR CHLOROTHALONIL (CONTINUED)

Data Requirement	Composition[1]/	Use Pattern[2]/	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)?
§158.145 Wildlife and Aquatic Organisms					
72-7 - Simulated or Actual Field Testing					
Aquatic Organisms	TEP	A,B,D,G,H	partially	RIOCHL06*	yes[13]
§158.150 PLANT PROTECTION TESTING					
122-1 - Seed germination/ seedling emergence	TGAI	B,D,G	no		yes
Vegetative vigor	TGAI	B,D,G	no		yes
122-2 - Aquatic Plant Growth	TGAI	B,D,G	no		yes

* Could fulfill requirement in conjunction with other test data.

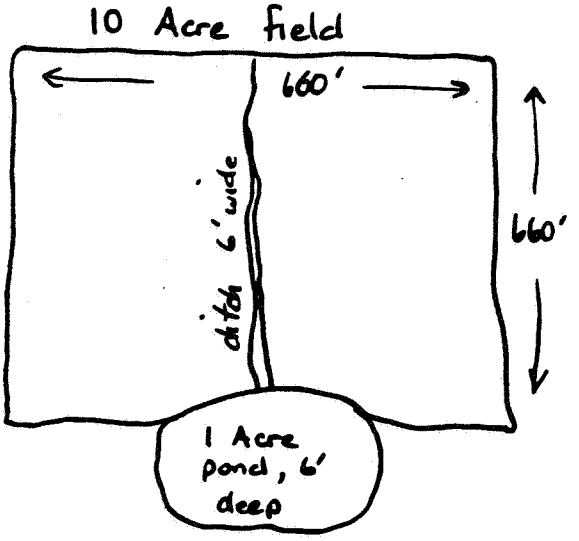
1 TGAI = Technical Grade Active ingredient; TEP = Typical End-Use Product; Degradate = DS-3701
2 A = Terrestrial Food Crop; B = Terrestrial, Nonfood; C = Aquatic, Food Crop; D = Aquatic Nonfood; E = Greenhouse, Food Crop; F = Greenhouse, Nonfood; G = Forestry; H = Domestic Outdoor; I = Indoor.
3 Not currently a requirement
4 Tests do not fulfill requirement because highest test level was 50 ppm and chronic residues greater than that are expected.
5 Reserved pending receipt of acceptable avian reproduction testing with both parent and degradate.
6 Required for the cranberry use only, 40.4% ai flowable concentrate.
7 Warmwater fish study shows degradate much less toxic than parent, therefore, coldwater study not required.
8 Estuarine studies required for corn, peanuts, soybeans, cranberry, cotton, turf, and marine antifouling paint uses.
9 Reserved pending receipt of formulated product testing with freshwater species.
10 Full fish life cycle study suffices.
11 Mysid Shrimp life cycle test required for marine antifouling paint use.
12 Bioaccumulation test results with species other than fish (e.g. bivalves) required for antifouling paint use.

TABLE A
GENERIC DATA REQUIREMENTS FOR CHLOROTHALONIL (CONTINUED)

13 Residue monitoring is required for the orchard and cranberry use to determine exposure to aquatic organisms. Registrant must conduct a 1-year residue monitoring study at multiple ($\geq$ 5) aquatic sites containing viable communities adjacent to representative orchard and multiple sites ($\geq$ 5) adjacent to cranberry growing areas treated with chlorothalonil at maximum label rates. Samples of water and sediment should be collected from runoff as it leaves the treated area and from several stations in the downstream/receiving water body. Aquatic organisms should also be collected for analysis since chlorothalonil bioaccumulates moderately. Residues found in organisms will indicate exposure possibly missed in other sampled materials. Sampling should continue throughout the use season and for several months following to detect persistent residues. Samples should be chemically analyzed for both parent and major degradate (DS-3701). Field personnel must be alert to any overt signs of toxicity exhibited by any nontarget organisms during the study, such exhibitions are to be reported. Such studies must not be in areas close to endangered aquatic or avian species or their essential habitat. The EEB recommends the registrant submit a protocol for evaluation before initiating the studies.

081901

Chlorothalonil / Cranberry Use EEC



Water Solubility <1 ppm

Application Rate 5.2 lb ai/A

Efficiency 60% (0.6)

Runoff 1% (0.01)

portion of 10 acres that the ditch is = 0.0091

$\frac{6' \times 660'}{660' \times 660'} = 0.0091$

1 - Aerial Application

ditch 5.2 x 10 x 0.6 x 0.0091 = 0.284 lb. loading into pond from ditch

runoff 5.2 x 10 x 0.6 x 0.01 = 0.312 lb. loading from runoff

drift 5.2 x 0.05 = 0.26 lb. loading from drift

total loading 0.856 lb.

x 61

52.2 ppb in pond after aerial application

2 - Ground Application

5.2 x 0.01 x 10 = 0.52 lb x 61 = 31.72 ppb in pond after ground app.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

19 FEB 1988

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Registration Standard (FRSTR)
for Chlorothalonil -
Nontarget Insect Studies

FROM: Allen W. Vaughan, Entomologist Allen W. Vaughan 2.18.88
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C)

THRU: Otto Gutenson, Acting Head - Section 4
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C) Otto Gutenson 2/18/88

THRU: Henry T. Craven, Acting Chief
Ecological Effects Branch
Hazard Evaluation Division (TS-769-C) Henry T. Craven 2/18/88

TO: Lois A. Rossi, PMT-21
Herbicide/Fungicide Branch
Registration Division (TS-767-C)

The Ecological Effects Branch (EEB) has reexamined the chlorothalonil Registration Standard with regard to nontarget insects. EEB's nontarget insect hazard evaluation remains essentially unchanged. Chlorothalonil was shown to be practically nontoxic to honey bees in an acute contact study. Thus, further testing on honey bees is not required.

cc: B. Lowery (SPSMS/HED)
D. Rieder (SIPS/HED)